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BLUE JAY

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Front Cover: *Dung roundhead* Protostropharia semiglobata *- C.R.J Hay*
Back Cover: *Mystery photo - the smile! - Harvey Schmidt*

Winter - Vicky Kjoss

Left - Figure 2: Yellowish-green blister galls on top surface of a leaf of the perennial sow-thistle produced by the larvae of the sow-thistle midge
Right - Figure 3: Reddish blister galls on top of a leaf of the perennial sow-thistle produced by the larvae of the sow-thistle midge. Photos by D. Peschken

A "bolete" mushroom of the genus Leccinum *C.R.J Hay*

Orange rock-posy - Bernard de Vries

Blue Jay

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BIRDS

NEST SITE USE, BREEDING SUCCESS, AND REPRODUCTIVE RATES OF CHIMNEY SWIFTS IN ST. ADOLPHE, MB, 2010-2013

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Chimney swift (*Chaetura pelagica)* populations have declined since the mid-1960s, as have populations of other aerial insectivores.[1,2,3] In 2009, the chimney swift was listed as Threatened (Schedule 1, Species At Risk Act).[4] The reduction of chimney swift populations has been attributed primarily to the loss of nesting and roosting habitat, pesticide use, and the associated decline of aerial insects.[1,2,5] It is, therefore, important to have data on the reproductive rates of chimney swifts occupying the remaining limited habitat as continued breeding success is necessary for the perpetuation of this species.

Data from chimney swifts nesting in five chimneys on four historic buildings in St. Adolphe, MB, between 2007 and 2009 have been reported.[6] The five chimneys represent the highest concentration of known nest sites in the province, which led the Manitoba Chimney Swift Initiative (MCSI) to designate St. Adolphe the "Chimney Swift Nesting Capital of Manitoba".[7] Situated approximately 15 km south of Winnipeg, St. Adolphe is near the northern periphery of the chimney swift breeding range.[6] The sequence of entry and exit events at a chimney, plus the associated duration-in and between-visit time intervals reflected different nesting stages.[6,8] Feeding rates of non-brooded juveniles were higher in St. Adolphe compared to chimney swifts nesting at southern latitudes.[6,9,10] Based on behavioural data, St. Adolphe chimney swifts had lower rates of successful nesting attempts and lower numbers of fledglings produced per successful attempt compared to birds in more southerly portions of the range.[6,9,10,11,12]

The St. Adolphe nest sites were monitored through four additional seasons (2010-2013) to increase the size of our data set on breeding success. We also used our behavioural observations to assess whether there is variability

in feeding rates with respect to weather and prey availability, and other factors associated with nest failures. We used the fallen nesting remains at two nest sites, each autumn and the following spring, to estimate reproductive rates. Clutch sizes, hatching rates, and fledging rates were confirmed at these sites. Estimates of fledging success based on physical evidence were compared to those based on behavioural observations.

Methods

Daytime and roosting hour (½ hour before sunset to ½ hour after sunset) observations were made following our previous studies.[6,8] Nesting occurred in five chimneys in St. Adolphe designated as (1) SE Club Amical, (2) NE Club Amical, (3) Brodeur Bros., (4) Church, and (5) Main St. (see Stewart and Stewart 2010 for details).[6] The times of entries and exits were recorded, and notes on associated behaviour (direction and speed of approach/departure, vocalizations, presence of other chimney swifts), weather (temperature, wind speed and direction, precipitation, cloud cover) and other notable environmental events (e.g., crop dusting on fields adjacent to St. Adolphe) were documented. Daytime observations were made at more than one site on any given day. Simultaneous multi-site roosting hour observations, timed to the second with synchronized digital watches, allowed us to count chimney swifts in St. Adolphe.

Fledging success was estimated for all five nest sites using behavioural data: the number of juveniles observed in the air or entering chimneys; roosting totals within 48 hours of fledging; and simultaneous multi-site roosting totals. At two chimneys which have accessible clean-outs, Brodeur Bros. and Main St., the fallen remnants of nesting attempts (nests, eggshells etc.) were recovered each autumn and the following spring. Whole eggs and egg fragments were used to estimate the number of eggs in the clutch. Intact eggs were used to estimate the proportion of the clutch that hatched. The number of nestling carcasses was subtracted from the number of hatchlings to estimate the maximum number of fledglings possible. In other words, if there was no in-chimney evidence of mortality, a hatched egg was assumed to have produced a fledgling. However, this number was retained only if there was no other evidence suggesting unobserved mortalities.

Recently hatched chimney swifts and unhatched egg. Hatchlings cannot regulate their body temperature and require brooding until they are 6-7 days old. -Bruce Di Labio

Results

All five chimneys were occupied by a nesting pair in each year from 2010 through 2013. Three times, two nests were started in the same chimney in the same season. To describe overall nesting patterns, we selected the more 'typical' of each for further analysis (see Table 1 for details). The phenology of the remaining 20 nesting attempts did not differ appreciably from that previously described for 2007 to 2009.[6] Therefore, we combined data from 2007-2009 with the 2010-2013 data, increasing the sample size from 10 to 30 nesting attempts (Table 1) with known outcomes.

We used the phenology over all years to calculate median dates for the onset of each nesting stage (Table 1). Sample sizes for median dates vary as nests fail and because there are some missing data. The median arrival date of nesting pairs was May 18, although arrival dates ranged from May 10 to June 25 (46 days). In five attempts, the second

bird of a pair arrived several days after the first, skewing the median arrival date, and were not included in this calculation (see Table 1). A secondary arrival of chimney swifts typically occurred in the third week of June. It is not known whether these birds were relocating from nearby areas or migrants arriving from the south. Since 2009, all five sites have been used and breeding pairs typically occupied the Church, NE Club Amical, and Main St. chimneys first. The SE Club Amical and Brodeur Bros. sites were the last to be occupied.

Nest building started soon after arrival (median date: May 22) and also spanned a wide range of dates (May 12-June 25, 44 d). In the absence of a partner, nest building proceeded with a single bird (e.g., SE Club Amical, 2013). Nest building tended to start immediately if a pair arrived in the third week of June. Overall, incubation started on June 26 (June 3-July 16, 43 d) and the median date on which feeding of non-brooded young started was July 6 (June 26-July 30, 34 d). Generally, feeding non-brooded young started on July 14 (July 7-30, 23 d) and fledging took place on August 1 (July 27-August 16, 20 d). The median date on which daytime use of nest sites ended was August 15 (August 7-28, 21 d).

Feeding rates in 2010-2013 varied more within years than reported previously for 2007-2009.[6] Minimum feeding rates of 1 entry/h were seen in most nest sites prior to nest failure. Maximum feeding rates were highly variable among years. In 2013, all non-brooded juveniles in the three successful nest sites were fed six to eight times per hour from mid-July through to fledging. The maximum feeding rate for non-brooded juveniles was 22 entries/h at Main St. in 2013.

Our behavioural observations indicated that 19 of 30 nesting attempts (63%) failed. The 11 successful nesting attempts produced an estimated 19 fledglings (median: 2; range: 1-3 per nest; Tables 1, 2).

We used the nesting debris observed in the Brodeur Bros. and Main St. chimney clean-outs to calculate clutch sizes and hatching rates, and to estimate fledging rates (Table 2). In 2009, the nest at Main St. failed during feeding of non-brooded juveniles (two dead nestlings were observed) but clutch size could not be verified due to a historical accumulation of debris in the clean-out.[6] Incubation behaviour was recorded at Brodeur Bros. in 2012, but no eggs were found

Table 1. Phenology for five chimney swift nest sites in St. Adolphe, MB. Years 2007-2009 are from Stewart and Stewart 2010. Dates indicate the onset of the nesting stage and all arrival dates are based on when a pair arrived, unless otherwise indicated. Three nesting starts (in italics) that were not representative of typical phenology were excluded

Year (hours of observation)	SITE	ARRIVAL DATE	NEST BUILDING	INCUBATE	FEED BROODED	FEED NON-BROODED	FLEDGE DATE **(Number fledged)**	DATE OF LAST USE D = DAY R = ROOST
2007 (32)	NE Club Amical	May 16	May 16-27	June 11	July 4	July 7	July 27-Aug. 1 **(3 V)**	R:Aug. 13-19
	Church	June 3	Nest failed Aug. 3					D:Aug. 3 R:Aug. 14-22
	Main St.					First observed July 26	Unknown	D:Aug. 1-14
2008 (122)	NE Club Amical	May 14-17	May 17-27	June 19	July 9	Failed July 13		R:Aug. 13
	Church	May 18	May 27-29	June 11	July 3	July 10-13	July 31 **(2 V)**	R:Sept. 2
	Main St.	May 18 n=1 June 17 n=1	May 30	June 30; Nest failed July 18-21				D:July 23 R:Aug. 5-14
2009 (174)	SE Club Amical	June 13-17	June 17-19	June 30-July 2; Nest failed July 21.				D:July 21 R:Aug. 14
	NE Cub Amical	May 19-26	May 19-26	June 9-13	July 2-8	July 16	Aug. 4 **(2 V)**	D:Aug. 11 R:Aug. 12
	Brodeur Bros.	June 19	~June 19	July 10-16; Nest failed July 26.				D:July 26 R:Aug. 3-6
	Church	May 11-21	May 29-June 2	June 3-7	June 26-July 13	July 18-20	Aug. 1 **(1 V)**	D:Aug. 28 R:Aug. 28
	Main St.	May 21 n=1 June 2-7 n=1	May 24	June 30-July 3	July 17-19	July 24-25; Nest failed July 29-30		D:July 31
2010 (253)	SE Club Amical	*May 16 n=1;* *May 17-19 n=2*	*May 17-19; ~ 1 day use*					
		June 20 n=3, Extra bird present	June 20 Extra bird presence variable until leaves ~June 30	July 11-12 Unstable July 15-19; long unattended periods	July 30; Nest failed Aug. 2=Day 4 of feeding			D:July 31-Aug. 2 R:Aug. 3-16
	NE Club Amical	May 16	May 17-19	June 23	July 8; Nest failed July 10=Day 3 of feeding			
			July 19; second nest	*July 30; Nest failed Aug. 2*				*D:Aug. 5-16* *R:Aug. 16-26*
	Brodeur Bros.	May 21 n=1 June 1 n=2	May 22 n=1 June 1 n=2	June 25-28	July 16	July 22 Extra bird arrived Aug. 11	Aug. 16=Day 32 of feeding **(2 V&P)**	D:Aug. 25 R:Aug. 27-Sept. 4
	Church	May 15 n=1 May 16 n=2 May 26 n=3, Extra bird present	May 17-19	June 16-19 Extra bird leaves ~June 19	July 1-3 Extra bird arrives ~July 5	Date unknown. Extra bird present first unattended = July 19	July 28~Day 28 of feeding **(1 V)**	D:Aug. 7 R:Aug. 27-Sept. 4
	Main St.	May 21	May 22	June 17-19	July 4; Nest failed July 8=Day 5 of feeding			D:July 10 R:July 31

from the primary analysis. The number of fledged young is the best estimate based on visual observations of birds entering and exiting the chimney (V) or physical evidence from the chimney inspection (P) (see Table 2 for details).

2011 (136)	SE Club Amical	*Unknown*	*May 25 n=1*	*Nesting attempt by single bird - abandoned June 6*				*D:June 6; R:unknown*
		June 11-16	June 11-19 n=1; June 21 n=2	July 7; Nest failed July 19=Day 12 of incubation				D:July 18 R:Aug. 9
	NE Club Amical	June 1-4	June 1-4	June 26-28	July 11	July 17	Aug. 6=Day 27 of feeding **(1 V)**	D:Aug. 14 R:Aug. 15-16
	Brodeur Bros.	May 25-26	May 26	June 25 (Extra bird onsite July 9-15); Nest failed July 16=Day 22 of incubation; no indication of hatching				D:July 15 R:Aug. 11-12
	Church	May 13	May 15	June 23-24	July 9	July 15; Nest failed Aug. 2=Day 25 of feeding.		D:Aug. 1 R:Aug. 7-8
	Main St.	Unknown	May 24	July 1-2 Nest failed July 19=Day 19 of incubation; no indication of hatching				D:July 18 R:unknown
2012 (102)	SE Club Amical	May 16 n=1 May 24 n=2	May 31	June 25-27 (Unstable activity July 8-11); Nest failed July 12-13				D:July 11-12 R:Aug. 13-18
	NE Club Amical	May 12	May 12	June 26-29	July 15	July 20; Nest failed July 31=Day 17 of feeding		D:July 30 R:Aug. 2-5
	Brodeur Bros./Big Country RV	May 16	May 24-31	June 25-27 incubation behaviour; Nest failed June 28-July 3; no eggs recovered				D: June 27-July 2 R: Aug. 13-16
	Church	May 17-18	May 17-18	June 14-21	July 4-7; Nest failed July 9-10			D:July 8-9 R:Aug. 6-12
	Main St.	May 10-16	May 14-16	June 22-27	July 9 Extra bird onsite July 11	July 14=Day 6 of feeding	Aug. 5= Day 28 of feeding **(4 P)**	D:Aug. 13-15 R:Aug. 16-19
2013 (145)	SE Club Amical	May 22-26 n=1; June 18-24 n=2	June 18-24	June 25-28	July 15	Nest failed July 20=Day 6 of feeding		D:July 20 R:Aug. 4-10
	NE Club Amical	May 12-22	May 12-22	June 25-29	July 8-10	July 14	Aug. 3~Day 27 **(2 V)**	D:Aug. 10 R:Aug. 12-21
	Brodeur Bros./Big Country RV	June 18-25	June 18-25	July 7-10	July 23	July 30; Nest failed Aug. 10 =Day 19 of feeding		D:Aug. 10 R:Aug. 12-21
	Church	May 12-22	May 12-22	June 18-24	June 30-July 3	July 11-13; Extra bird onsite July 22-23	Aug. 1 ~Day 30 **(2 V)**	D:Aug. 17-20 R:Aug. 23-24
	Main St.	May 12-22	May 12-22	June 24- July 1	July 9-11	July 12-15	Aug. 9 **(5 P)**	D:Aug. 12-18 R:Aug. 20-21
Summary								
	Earliest start	May 10	May 12	June 3	June 26	July 7	July 27	Aug. 7
	Latest start	June 25	June 25	July 16	July 30	July 30	Aug. 16	Aug. 28
	Median start	May 18*	May 22**	June 26	July 6	July 14	Aug. 1	Aug. 15
	n	25	24	29	21	14	11	8

* If pairs that did not arrive within 2 d of each other are included, the median date is May 25 (n=30).
** If nests started by one bird are included, the median date is unchanged (n=29).

Table 2. Summary of nesting outcomes for five St. Adolphe chimneys, 2007-2013. Estimates of fledging success based on visual observations of birds entering and exiting the chimney (V) and, for two chimneys, examination of physical remains of nesting attempts (P) in the chimney clean-out after the birds left (and before arrival, if indicated). The Best Estimate uses physical evidence when present unless otherwise noted.

Year	Site	Fledgling Visual Estimate	Physical evidence	Fledgling Physical estimate	Fledgling Best Estimate	Comments
2007	SE Club Amical					No chimney swifts seen using this chimney.
	NE Club Amical	3			3	
	Brodeur Bros.					Not identified as a nest site until 2009.
	Church	0			0	
	Main St.	unknown				Identified as nest site on July 26. Outcome unknown.
2008	SE Club Amical					No chimney swifts seen using this chimney.
	NE Club Amical	0			0	
	Brodeur Bros.					Not identified as a nest site until 2009.
	Church	2			2	
	Main St.	0			0	
2009	SE Club Amical	0			0	
	NE Club Amical	2			2	
	Brodeur Bros.	0	4 unhatched eggs. **Clutch size = 4**	0	0	
	Church	1			1	
	Main St.	0	2 recent carcasses		0	First inspection; many years of debris; clutch size undetermined
2010	SE Club Amical	0			0	
	NE Club Amical	0			0	
	Brodeur Bros.	2	6 half eggshells; 1 broken egg; 1 dead juv. ~20 d old; no nest. **Clutch size = 4**	2	2	
	Church	1			1	
	Main St.	0	Sept. 2010: 1 egg with protruding beak; 8 half eggshells; 4 dead juv.; no nest. April 2011: 1 unhatched egg in 2010 nest. **Clutch size = 6**	0	0	
2011	SE Club Amical	0			0	
	NE Club Amical	1			1	
	Brodeur Bros.	0	4 unhatched eggs; 3 empty eggs with small holes; no nest. **Clutch size = 7**.	0	0	
	Church	0			0	
	Main St.	0	July 2011: 7 half eggshells; 2 dead juveniles ~1-2 days old; no nest; April 2012: 2011 nest; 1 unhatched egg. **Clutch size = 5**	(2)	0	Last day-time use: July 18. Nest failed; remains of two dead nestlings were not recovered.
2012	SE Club Amical	0			0	
	NE Club Amical	0			0	
	Brodeur Bros./Big Country RV	0	no eggs; no intact nest. **clutch size undetermined**	?	0	The presence of twig clumps, feathers, and guano support observational evidence of a nesting attempt.
	Church	0			0	
	Main St.	1	residue of 2011 eggshells; intact nest; 9 half eggshells; 1 dead juvenile ~ 7 d old. **Clutch size = 5**	4	4	
2013	SE Club Amical	0			0	
	NE Club Amical	2			2	
	Brodeur Bros./Big Country RV	0	5 half eggshells; shell fragments; 3 carcasses. **Clutch size = 3**	0	0	The presence of large clumps of twigs and pieces of mortar suggest the nest fell.
	Church	2			2	
	Main St.	2	10 half eggshells; no carcasses; no nest. **Clutch size = 5**	5	5	

Adult chimney swift incubating eggs. Note the long, tapered wings which extend past the short, stubby tail. Bristles on the tail feathers help brace a chimney swift clinging to the wall of a chimney.
-Bruce Di Labio

in the chimney clean-out material (Table 2). Thirty-nine eggs were recovered from chimney clean-outs indicating clutch sizes ranging from 3-7 eggs/nest (mode: 5, Table 2).[6] Overall, the hatching rate was 56% (22/39 eggs) and the fledging rate was 28% (11/39 eggs). Nesting attempts in the two chimneys had markedly different outcomes. The Brodeur Bros. site produced 18 eggs, of which 6 hatched (33%) and 2 fledged (11%) while Main St. produced 21 eggs, of which 16 hatched (76%) and 9 fledged (43%).

Extra adults were seen entering nest sites before the young had fledged. Three or more consecutive entries or exits indicated that more than a breeding pair was using the nest site. However, no hostile takeover of nest sites was documented.

Discussion

Generally, the time-frames for nesting stages in 2010-2013 were as described for 2007-2009.[6] Some variation could result from the limitations of behavioural sampling. Interval sampling

approximates the onset of events. The start of incubation was not always obvious. The transition from incubating to feeding was clear, however, and we were able to back-calculate to the start of incubation using an incubation period of 18-21 days.[6,8,10] This indicated that the characteristic incubation exchanges in which one adult enters and one leaves the chimney within a minute, did not always occur in early incubation.

The transition from feeding brooded to non-brooded juveniles was not always obvious. This stage was usually confirmed by observing consecutive entries or exits, hence the young are "unattended", but monitoring sessions did not necessarily detect this pattern. Adults may simply move to the wall of the chimney after feeding the young.[11] An increase in feeding rates of three to four times per hour or more indicated that older juveniles were in the nest.

Behavioural evidence of fledging was a classic 'parade' of juveniles or fluttery entries by inexperienced birds.[10] Low flying juveniles also were identified by wing edges which were intact at a time when adults had notches or gaps with missing feathers due to moulting. However, counting fledglings is challenging. It is not always possible to evaluate wing margins as birds enter or exit a chimney and fledglings quickly develop flight proficiency. As adults often redistribute themselves locally shortly after fledging, an increase in the number of birds roosting in a nest site did not always reflect fledglings returning to their natal chimney. Problematically, juveniles fledged at more than one site within days of each other and shared common flight training grounds. Juveniles also entered non-natal sites to rest.

In five cases, physical evidence of in-chimney mortality agreed with visual estimates of the number of fledglings (Table 2). However, estimating fledging success from the physical remains found in the chimney may produce an over estimate if all evidence of in-chimney mortality is not recovered. At Main St. in 2011, nesting remains accounted for only three of the five eggs laid, which by simplistic arithmetic, would suggest two fledged. But the nest was abandoned on July 18 during incubation so the physical evidence alone was misleading. In the remaining two cases, the physical evidence indicated there could have been four, instead of one, and five instead of two fledglings but the exact number of fledglings cannot be estimated with certainty.

Using chimney clean-out observations, clutch sizes in St. Adolphe ranged from 3-7 which resemble those in Texas but are somewhat higher than the 3-5 eggs typically found in mid-range New York and Illinois.[10,11,13] The overall St. Adolphe hatching rate (percent of eggs laid that hatched) was 56%, significantly lower (X^2 goodness-of-fit, $P < 0.0001$) than the 90.7% hatching rate reported in 1958 for New York.[1,9,12] The overall fledging rate (percent of eggs that produced fledglings) of 28% is also significantly lower (X^2 goodness-of-fit, $P < 0.0001$) than the 86% reported for New York.[1,9,12] In one season in Kansas, 71% of hatchlings fledged.[1] Using this alternative method of calculation (fledglings/hatchling), St. Adolphe had a 50% fledging rate (11/22) overall and was much lower at Brodeur Bros. (33%; 2/6) than the Main St. site (56%; 9/16). Using either method of calculating fledging success yields lower rates in St. Adolphe than any published estimates.

Another measure of breeding success is the number of young fledged/nest. We compared the estimates from chimney clean-outs to those based on behaviour observations. Between 2010 and 2013, when we had complete data for both sites, the Brodeur Bros. and Main St. sites produced 11 fledglings from 8 nesting attempts, a rate of 1.4 fledglings/nest. Behavioural observations for the same period indicated only five fledged from these two chimneys, an underestimate of approximately 50%. If behaviour observations similarly underestimated fledgling counts for all nest sites with inaccessible chimney clean-outs, the adjusted total for 2007-2013 would be 38 fledglings from 30 nesting attempts, or 1.3 fledglings/nest. For other (unspecified) geographic areas, a mean of 3 fledglings/nest is cited in the COSEWIC report and 3.7 fledglings/nest is reported for New York.[1,9,12] Clearly, breeding success in St. Adolphe is lower compared to other areas farther south. There are no comparable published data for elsewhere in Canada.

Reproductive rates can also be underestimated if clean-outs are not examined systematically. For example, at Main St. in 2011, remains were observed in the autumn but the nest and another egg were not seen until the inspection in the spring of 2012. Some eggshells/young may not be recovered at all if material clings to the rough interior surfaces of the chimney or is caught in spider webs.

It appears that the only nesting

attempt without pre-fledging mortality was Main St. in 2013. Otherwise, failures occurred at every nesting stage from nest building to feeding non-brooded young. The factors implicated in nest failures include structural integrity of the habitat, late arrival, general weather patterns and prevailing local conditions, and the availability of aerial insects.

and appeared to have been unoccupied until 2009. An artificial chimney erected in 2010 by MCSI near the Church has never been occupied, suggesting nesting habitat may not be limiting in St. Adolphe.[7]

Since 2009, all five nest sites identified in St. Adolphe have been occupied every year including 2013. However, the chimneys

Non-brooded chimney swifts in the bowl of the nest. At approximately 21 days of age, juveniles will move to the wall beside the nest and begin short flights inside the chimney. Fledging, or flying outside of the chimney, occurs at 28-30 days of age. -Ben Di Labio

In 2007 and 2008, the SE Club Amical site was observed regularly and not occupied by chimney swifts. The Brodeur Bros. site was observed sporadically

do not appear to be equally attractive to chimney swifts. The Brodeur Bros. chimney vents an oil-powered furnace and it is one of the last chimneys to be

occupied in the spring. Although more attractive to the chimney swifts, the Main St. site had crumbling mortar prior to the spring of 2010 when the chimney was repaired.[7] Breeding success has been higher in Main St. since the above-roof portion was rebuilt, suggesting some previous failures may have resulted from the structural decline.[6]

A minimum of 9 weeks is required to build a nest and fledge young so chimney swifts in St. Adolphe have time for only one clutch.[6,9,10,12] A breeding pair must begin nest construction by the end of May or early June to be successful. No chimney swifts arriving in late-June were ever successful at nesting. As a result, attempts at the Brodeur Bros. and SE Club Amical chimneys were the least successful of the sites in St. Adolphe.

An abundance of suitable insects, which is reflected in feeding rates, is required for successful nesting. Chimney swifts are vulnerable to periods of reduced feeding opportunities or prey availability.[1,10,13] Generally, aerial insect abundance is tied directly to weather patterns and more time elapses between feeding visits with increasing temperature, wind speed, and precipitation.[13] In St. Adolphe, some nests failed after several consecutive days of continuous rain (e.g., NE Club Amical, 2010) or extended periods of extreme heat (>30 C) combined with high humidity (humidex >35 C) and strong winds (>50 kph) (e.g., Church, 2011). The lowest breeding success rates occurred in 2011 and 2012 (Tables 1, 2), years that had extreme weather patterns and low mosquito counts.[14,15,16,17] Feeding rates at the Church in 2011 often were below the local average of 3-4 times per hour for non-brooded juveniles, falling to 1 entry/h for 23-24 day-old young.[6] Although there were two carcasses of 1-2 d old birds in the clean-out at Main St. in 2011 (Table 2), there was no change in rates of entry which denote hatching, that is, normal feeding rates were not seen.[6] Conversely, the highest breeding success rates in St. Adolphe occurred in 2013 when three sites produced an estimated nine fledglings (Tables 1, 2).[6] There were no extended periods of heat, humidity, high winds, or sustained periods of rain, and mosquito counts were generally average to above average.[18] At successful nest sites, feeding rates in 2013 were at or above average for non-brooded juveniles and the highest feeding rate we have recorded (22 entries/h) was at Main St. on July 22.[6]

Prey availability can also be affected by human activities. St. Adolphe is part of the City of Winnipeg buffer zone for mosquito abatement.[18] It is also surrounded by agricultural land where aerial spraying of pesticides is used to control aphids on soybean crops (A. Lagasse, pers. comm.). Pesticides may affect birds directly by reducing their prey base or indirectly by impairing reproduction.[2,19,20] A recent Ontario study of chimney swift guano demonstrated links between the historical use of DDT and dietary shifts in chimney swifts.[5] Pesticide use altered prey abundance, food quality, and type.[5] Dietary changes are likely related to the declining populations of chimney swifts.[5] Local pesticide use may be affecting the quality and quantity of insects available for nesting chimney swifts in St. Adolphe given the evidence for low reproductive success.

Weather conditions, hence prey availability, appear to influence migration dates. In years with favourable weather, when feeding rates were average or above average, pre-migratory groups (e.g., 2010 and 2013, Table 1) congregated at successful nesting chimneys.[6] Such relocations took place shortly after fledging had occurred from at least one site. Unsuccessful pairs were the first to relocate, then successful pairs and their offspring. If the departure of the birds from a nest chimney resulted in a decline in the total St. Adolphe count, we concluded the chimney swifts had begun their fall migration. Leaving directly from the nest site was more common in poor weather years such as 2011 and 2012 (Table 1). The start of migration was characterized by the general decline in numbers of roosting birds until the counts reached zero. Thereafter, small numbers of migrants (usually one or two) occasionally roosted at one of the sites before all site use ended for the season.

In St. Adolphe, extra birds entering nest sites have disturbed incubation and feeding activity. In 2011, the Brodeur Bros. nest failed on Day 22 of incubation (full term eggs). Three of the seven eggs observed in the clean-out had small holes in them; the interiors were empty. The eggs appeared to have been infertile as a developed embryo should have been present. We noted the entrance of extra adults the day before the 2011 nest failure occurred at Brodeur Bros. Mortality resulting from non-parental aggression in St. Adolphe is possible but we cannot confirm it.

While an abundance of aerial

insects is required for successful fledging, the location of prey is an important factor too. In fragmented habitats, areas of concentrated prey occur beyond the foraging distance where adults can make a timely return to the nest site with food. Chimney swifts do not always forage near nest sites but rapidly approach a chimney and leave the area quickly upon exit. Also, there is typically a decline in the use of the nest site area post-fledging and no swifts were seen feeding locally in the daytime by one week post-fledging; chimney swifts returned for roosting only.[6] The variation seen in the presence of chimney swifts feeding near the nest sites and the variation in feeding rates suggest that the optimum foraging patch is not always near the chimneys. Nestlings may starve if the adults are unable to adequately feed them.

The only source of confirmed adult mortality in St. Adolphe was entrapment i.e., adults leaving a chimney through gaps and being confined to an area where they could not feed.[6] Unconfirmed mortality of a chimney swift followed a predation attempt. Two migrant chimney swifts circling Club Amical at the end of the roosting hour were pursued vigorously by two Cooper's or Sharp- shinned hawks (Aug. 17, 2011); one chimney swift returned shortly thereafter. No estimate of juvenile mortality outside of the chimneys post-fledging has been made.

In conclusion, we found that the availability of nest sites in St. Adolphe does not appear to be limiting population growth. Chimney swifts in St. Adolphe have a short breeding season and if nesting does not begin by June 1st it is likely to fail. Nest failure rates were high when severe weather reduced prey availability, hence feeding rates. While clutch sizes were within the range of published values, hatching and fledging rates in St. Adolphe are lower than published data for the United States; there are no comparable published data from Canada. Factors influencing the low hatching and fledging rates warrant further study.

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Top and bottom - Chimney swifts flying *- Christian Artuso*

INSECTS

CYSTIPHORA SONCHI AND *C. TARAXACI* (DIPTERA: CECIDOMYIIDAE) - SISTER SPECIES WITH SIMILAR MORPHOLOGY BUT DIFFERENT POPULATION DYNAMICS

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Introduction

The purpose of this paper is to report on the population development of the midge *Cystiphora sonchi* as compared to that of the *Cystiphora taraxaci*. As far as I know these insects do not have an official common name, and I will call them "sow-thistle midge" and "dandelion midge" respectively.

The sow-thistle midge oviposits only on sow-thistle (*Sonchus*) species.[1] Females oviposit into leaves via the stomatal openings of the lower epidermis.[2] (Figure 1). The larvae produce slightly raised, round, yellowish-green or reddish to red blister galls, about five millimeters in diameter. (Figures 2, 3) From the underside, they appear light grey in the early stage of development, and contain one or two whitish larvae which may be seen through a thin layer of cells that lack chlorophyl (Figure 4). Female sow-thistle midges produce single-sexed broods.[3]

Originally imported from Europe by Agriculture Canada, the sow-thistle midge was released as a biological control agent to help

Figure 1. Sow-thistle midge laying an egg through stomatal opening on the underside of leaf of perennial sow-thistle. -R. DeClerck-Floate

Figure 2. Yellowish-green blister galls on top surface of a leaf of the perennial sow-thistle produced by the larvae of the sow-thistle midge (see inside front cover for close-up colour image) -D. Peschken

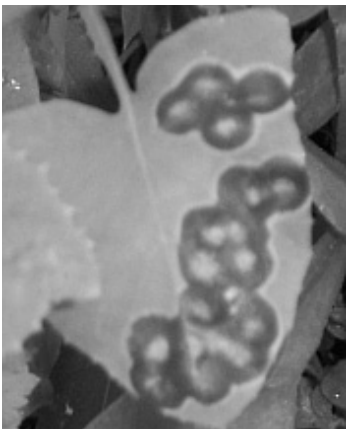

Figure 3. Reddish blister galls on top of a leaf of the perennial sow-thistle produced by the larvae of the sow-thistle midge. (see inside front cover for close-up colour image) D. Peschken

control weedy sow-thistle species in British Columbia, Alberta, Saskatchewan, Manitoba, Quebec and Nova Scotia starting in 1981.[4,5] The insect spread rapidly and is now very widely distributed in the three prairie provinces. It is also established in Nova Scotia, maybe in New Brunswick but not in British Columbia and Quebec. It has spread into Minnesota (personal observation).

In 1987, at Outlook, Saskatchewan, leaves could be found that were completely covered with galls. Up to 700 were counted on one leaf but with many galls coalescing that an accurate count could not be made (Peschken unpublished). This level of infestation could not be found in subsequent years. For example,

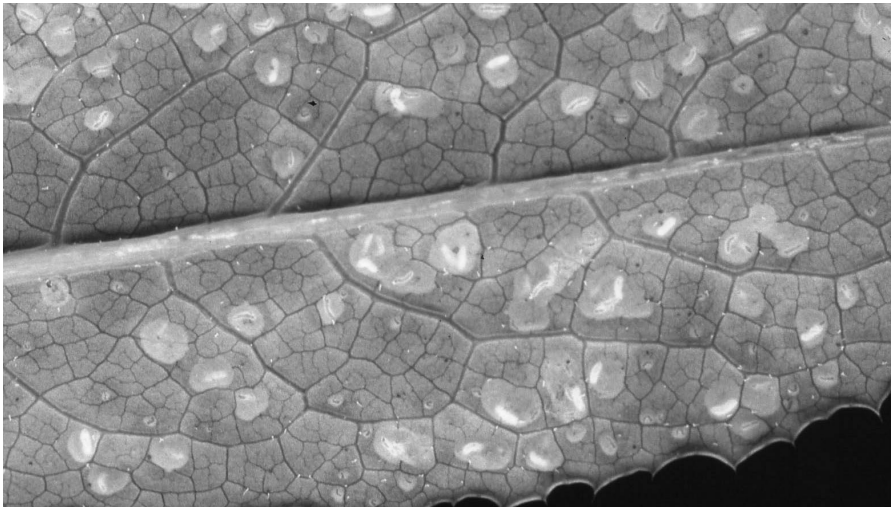

Figure 4. Blister galls of the sow-thistle midge as seen on the underside of a leaf of the perennial sow-thistle. - D. Peschken

in 1991, the maximum count on one leaf was 265 and the average was much less. A similar midge population collapse occurred in Alberta.[5] Perennial sow-thistle was not controlled anywhere in Canada.

The larvae of the sow-thistle midge have been commonly parasitized by the parasitic wasps *Aprostocetus* sp. near *atticus* and to a lesser extent by 3 other parastic wasps, *Neochrysocharis formosa* (Westwood), *Chrysonotomyia* sp. (Hymenoptera: Eulophidae) and *Zatropis* sp. near *justica* (Hymenoptera: Pteromalidae*)* in Alberta and Saskatchewan.[5] *A.* sp. near *atticus* and *Chrysotomyia* sp. also parasitize the larvae of the dandelion midge.[6]

In July 1980, Murray Maw (formerly at the Regina Research Station, Agriculture Canada) collected blister galls from dandelion (*Taraxacum officinale*) at Holbein, Saskatchewan. Adults that emerged from these galls were identified as *Cystiphora* sp., possibly *canadensis*. In 1989, I discovered numerous blister galls on dandelion near Nipawin, Saskatchewan (Figure 5), very similar to those on perennial sow-thistle. Females reared from these galls could not be differentiated from those of the sow-thistle midge.[4,7] By means of the male genitalia, the midge was identified as the dandelion midge, which had not been reported in Canada.[6] It is assumed to have

Figure 5. Reddish-green blister galls on a dandelion leaf produced by the dandelion midge. D. Peschken

been accidentally introduced into Canada from abroad.

The dandelion midge occurs widely in Europe and was found in Kashmir.[6] It oviposits only on species of the genus *Taraxacum*.[6, 7, 8] The sow-thistle and dandelion midges both produce several generations per year.

In 1989 and 1992, the distribution of the dandelion midge was surveyed by searching for galls on dandelions at intervals of 20-30 km along roadways in north-central Saskatchewan.[6] The survey was limited to the area from Carrot River in the E to Prince Albert in the W, and S to Humboldt and Tisdale. Galls were found on 17 out of 31 sites. The insect may have occurred over a larger area to the N, E and W, although no galls were found S of Tisdale. To determine any population change, I conducted further surveys in 2007 and 2012.

Method

On 11 and 12 Aug 2007, six sites along Highway six between the Qu'Appelle River and Melfort, two sites up to 50 km south of Tisdale, and 12 sites in an area defined by Melfort, Choiceland, White Fox, Nipawin and Tisdale were surveyed, roughly in the same survey area as in 1989 and 1992. On 20-22 July 2012, 32 sites in the area defined by

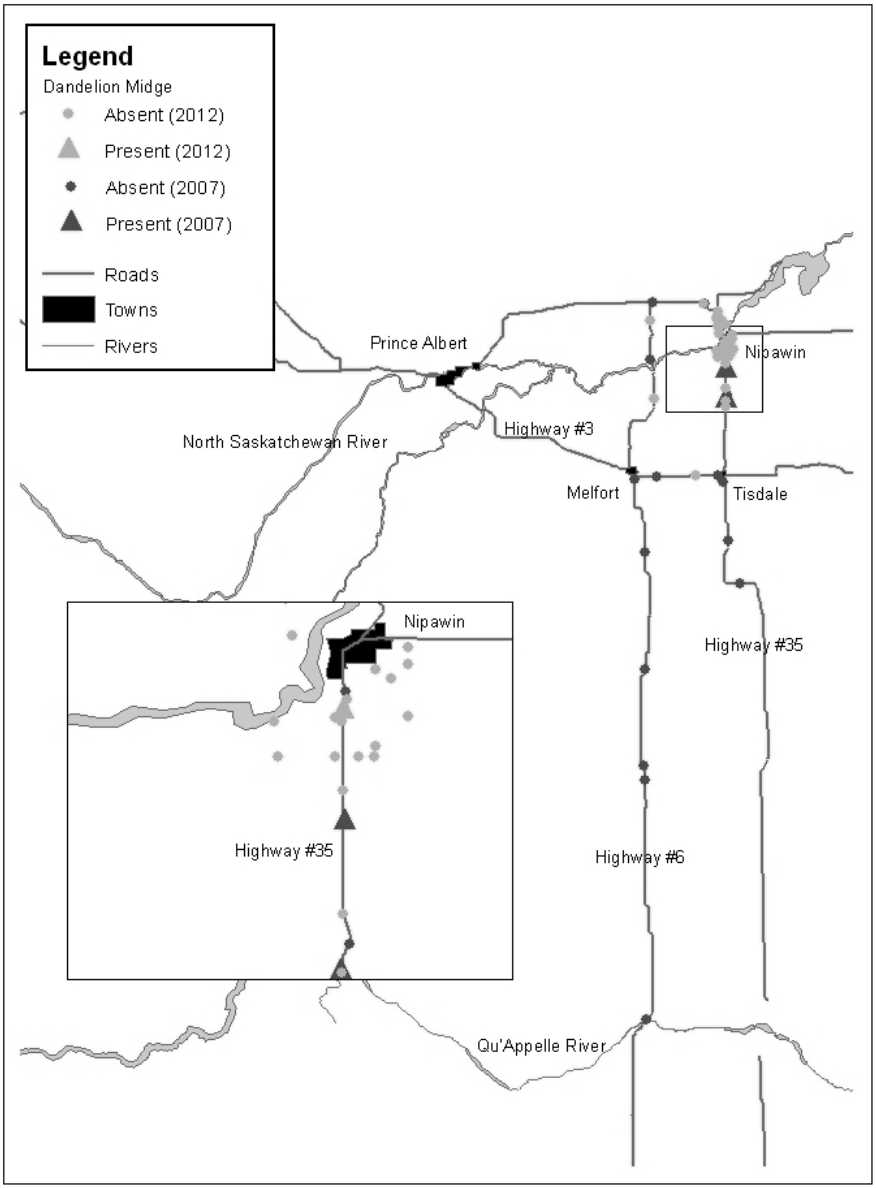

Figure 6. Sites surveyed in 2007 and 2012, indicating the presence or absence of the dandelion midge.

Melfort, Choiceland, White Fox, Nipawin and Tisdale were again surveyed. The sites were located along highways or gravel roads. I surveyed each site for five - ten minutes for consistency. The presence of perennial sow-thistle and galls was also noted and

served as an indication that use of insecticides did not cause the absence of galls of the dandelion midge.

Results and Discussion

In 2007, galls of the dandelion midge were found on only one dandelion plant on each of two sites, with 16 and 38 galls, 21 and 24 km south Nipawin respectively (Figure 6). Galls of the sow-thistle midge were found on all sites. In 2012, galls of the dandelion midge were found on only one site, on two dandelion plants, with 15 and eight galls respectively, 3.9 km south of Nipawin. Perennial sow-thistle occurred on 30 of the 32 sites, and galls of the sow-thistle midge, often quite numerous, on 26 sites. Thus, the low incidence of the dandelion midge is not due to insecticides.

The two midges are sister species. They are morphologically almost identical. Both midges occur over wide regions in Europe and Asia and their host plants are frequent weeds in the Canadian prairie provinces But the two midge species differ in their population dynamics. According to previous surveys, the sow-thistle midge spread rapidly in the three western provinces since its release. But the dandelion midge seems to have decreased, at least in the area that was surveyed. Thus, this might be an example that the population of an accidentally introduced biological organism remained at a low density or even declined.

One reason for the different population dynamics might be the difference in plant architectures of the two host plants species. Dandelion leaves form a relatively low and dense basal rosette, while perennial sow-thistle has an open growth form and becomes 30 - 150 cm high. It is possible that the low-growing dandelion is the preferred micro-habitat for the parasitic wasps that prey on both midges, and that the dandelion midge is therefore more vulnerable to parasitic attack.

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Blister galls on perennial sow-thistle. - D. Peschken

FUNGI

AN INITIAL SURVEY OF MUSHROOMS IN GRASSLANDS NATIONAL PARK, SASKATCHEWAN

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Introduction

Grasslands National Park (GNP) is located in southwestern Saskatchewan (49.21809, -107.56192) and is representative of the mixed-grass prairie ecoregion.[1] It is a relatively new national park, being established in the 1980s.[2] It is composed of a west block and an east block, containing a variety of vegetation types and geological features: upland grasslands, badlands, the Frenchman River valley, prairie dog colonies, restoration fields, eroded sloped grasslands, and small areas of aspen forest. Precipitation for the GNP area during the summer of this study was above average, creating ideal

A "puffball" mushroom of the genus Calvatia *in the recently burned Two Trees Trail area of Grasslands National Park, Saskatchewan (June 17, 2013).*

conditions for the emergence of fruiting bodies of mushrooms.[3]

Fungi are interestingly paradoxical: diverse yet poorly studied, vital to ecosystems yet neglected in biodiversity conservation. Of the estimated 1.5 million species of fungi in the world, macrofungi (or "mushrooms") represent a small portion estimated at 57,000 species of which less than half are known.[4,5] Fungi play important and unique roles in ecosystems as decomposers, symbiotic partners, parasites, and as food and habitat for many species. They are not unlike other organisms needing conservation, being susceptible to common threats: habitat loss, pollution, habitat fragmentation, and climate change.[6] In recent years the neglect of fungi in biodiversity conservation initiatives has been brought to light and there has been an increasing number of calls to action for the conservation of fungi.

Several European countries have taken initiative and produced national red lists of mushrooms. In 2003 the European Council for the Conservation of Fungi (ECCF) developed a Red List for 33 species of European fungi to propose to the Bern convention.[7] In Canada and the United States a Handbook to Strategy 1 fungal species of the northwest forests lists 135 species.[9] Though these documents were well crafted, with detailed biological and management information on each species, protection of fungi at a species level has not yet been legislated.

In addition to conservation documents, research has been conducted into the viability of using mushrooms as indicator species in ecosystems. Certain ectomycorrhizal species of mushrooms have declined with increasing acid rain, suggesting their usefulness as indicators of pollution and forest health.[10, 11] Waxcap mushrooms are sensitive to fertilizer application and have been used to identify and classify unfertilized grasslands where they are abundant.[12] The creation of fungal "checklists" for certain areas has many uses: as a step towards more detailed documents (and potentially Red Lists), to compare fungal diversity over time, for species range and habitat preference data, and to increase public appreciation for fungi.[6,13]

Surveys of mushrooms in national parks of Canada have been undertaken in the past. Numerous fungal surveys were conducted across Canada in the 1970s, and although these included some mushroom-

A "bolete" mushroom of the genus Leccinum *growing in mycorrhizal relationship with aspen trees in the small forest of 70 Mile Butte Trail in Grasslands National Park, Saskatchewan (Aug 17, 2013).*

forming species, they were mainly focused on forest diseases such as rusts and wood rots with limited results.[14] A larger survey in St. Lawrence Islands National Park, Ontario focused mainly on mushrooms and made them more accessible to the public, producing a list of 503 species.[15] Kejimkujik National Park in Nova Scotia was studied over two years, producing a substantial list of species with certain ones highlighted as potential pollution indicators.[11] In Saskatchewan, the Prince Albert Model Forest and region had a large list of species produced from a survey of mycorrhizal morphotypes and mushrooms.[16]

Grasslands National Park in southern Saskatchewan has been studied for years for its diverse and conspicuous lichen fungi and research has been conducted on mycorrhizal fungi, but none on the mushrooms.

Methods

This floristic survey was designed to identify and collect as many different species of mushrooms as possible. The study area comprised both the west and east blocks, including parcels still in

transition to park management (e.g. Dixon and Walker lands within the west block proposed boundary). Occasional trips were made to remote parts of the park representing under-surveyed communities (such as forested areas of the east block). The time period was limited to the summer months of 2013 (May 1 to August 31).

To raise awareness of the presence of mushrooms in the park and to widen the survey, visitors and park employees were encouraged to contribute by sending digital photos of mushrooms along with location and habitat data to the principal investigator. Observations were posted on MushroomObserver.org where other mycologists who are members of the website suggested identifications and voted to arrive at a consensus and level of confidence.

Panaeolus semiovatus *growing in abundance on bison dung in Grasslands National Park, Saskatchewan (May 30, 2013).*

The principal investigator received a permit to collect specimens for future study. Unique species were collected as soon as possible after an observation was made or reported. Photographs were taken, and GPS coordinates and habitat conditions recorded. Fruiting bodies were then carefully removed from the substrate, wrapped in parchment paper, and placed in containers for transport. After an attempt had been made to obtain a spore print, the specimens were dried in a dehydrator at 55°C for two days. Microscopy was limited to assisting with identification of difficult species.

Results

A total of 58 observations of individual mushrooms were recorded on MushroomObserver.org, and 36 specimens were collected.[17] From these, 40 different species across 28 genera were identified (Table 1). These species can be assigned to nutritional guilds: saprophytic

Two young Protostropharia semiglobata *looking like egg yolks - yellow and slimy - on bison dung in Grasslands National Park, Saskatchewan (July 9, 2013).*

(25 species), lignicolous (7 species), and ectomycorrhizal (6 species). Saprophytic fungi obtain nutrients from dead organic matter, "lignicolous" refers specifically to fungi that consume wood, and ectomycorrhizal fungi have mutually beneficial symbiotic relationships between their underground hyphae and the roots of plants.

By far the most common mushroom in the park was *Marasmius oreades.* Also known as the "fairy ring mushroom" it was found almost anywhere with grass, often in clusters and sometimes several growing in an arc to form a large circle. Coprophilous (dung-loving) mushrooms were

Mature Protostropharia semiglobata *on bison dung in Grasslands National Park, Saskatchewan. They are similar in appearance to the hallucinogenic* Psilocybe cubensis *and were once placed in the same genus, though they are considered "inactive".*

also common and conspicuous, without apparent preferences for dung of bison or cattle. Their range and abundance directly corresponds with that of the grazing animals in the park because of their exclusive habitat needs. Several species of the gasteroid fungi (puffballs) were found in the grasslands, but also on disturbed trails and even the badlands (notably the relatively rare *Battarrea phalloides*). The most common puffball, *Calvatia cyathiformis*, ranges in size from a golf ball to soccer ball but is easy to identify because of its purplish spore powder.

One outcome of the study was an increased appreciation for fungi. A presentation of mushrooms in the park was given on August 8, to good attendance from park staff, researchers, and Val Marie citizens. Several contributors were surprised at the number of fungi present and at least one person admitted they used to be uninterested or disgusted but are now intrigued.

Discussion

Species in Table 1 are organized into general taxonomic categories.[18] Each species was assigned to a nutritional guild (saprophytic, lignicolous, or ectomycorrhizal) and more specific habitat needs are noted according to observations over the study. Tentative ranks are given as to rarity based on the principal investigator's impressions from personal observations and collective observations and conversations with other contributors. These should be taken with caution given the limited scope of this study and because fruiting body abundance is known to be unpredictable. It should be noted that slime moulds are now only considered fungi in a traditional sense ("myxomycota") and that although *Apiosporina morbosa* (black knot) is not often considered a "mushroom" it is still included since it is a conspicuous non-lichenized macrofungi.

Forests represent a very small area of the park. They are primarily of aspen trees (*Populus tremuloides*) and the largest area is located in the east block and difficult for tourists to access. A small forest can be found along a portion of the popular 70 Mile Butte trail in the west block. These areas were home to a strikingly different set of mushrooms representing most of the species that are lignicolous (consuming wood) and ectomycorrhizal (symbiotic with plant roots). As might be expected, the forests housed an abundance of diverse fungi, though they were not extensively studied in this project.

Table 1. Mushroom species observed in Grasslands National Park.

Name/ Category	Authority	Guild	Specific Habitat	Rarity*	Specimen**
Myxomycetes (Slime Moulds)					
Physarum sp.	Pers.	N/A	Forest	U	X
Stemonitis sp.	Gled.	N/A	Forest	U	X
Ascomycetes (Cup Fungi)					
Apiosporina morbosa	(Schwein) Arx.	Lignicolous	*Prunus* spp.	C	X
Pezizaceae sp.	Dumort	Saprophytic	Disturbed areas	R	
Basidiomycetes (Polypores, Stereum, and analogues)					
Fomes fomentarius	(L.) J. Kickx f.	Lignicolous	Wood	C	X
Ganoderma applanatum	(Pers.) Pat.	Lignicolous	Wood	U	X
Polyporales sp.	sensu lato	Saprophytic	Moss	R	X
Trametes sp.	Fr.	Lignicolous	Wood	C	X
Trichaptum biforme	(Fr.) Ryvarden	Lignicolous	Wood	C	X
Basidiomycetes (Clavaria and similar fungi)					
Artomyces pyxidatus	(Pers.) Jülich	Lignicolous	Wood	U	X
Basidiomycetes (Hygrophorus and related species)					
Hygrocybe conica ?	(Schaeff.) P. Kumm.	Saprophytic	Grasslands	R	
Hygrocybe miniata ?	(Fr.) P. Kumm.	Saprophytic	Grasslands	R	
Basidiomycetes (Tricholoma and related fungi)					
Arrhenia sp. ?	Fr.	Mycorrhizal?	Moss (Grassland)	U	X
Clitocybe sp.	(Fr.) Staude	Saprophytic	Moss (Grassland)	VC	X
Basidiomycetes (Marasmius, Mycena, Collybia and allies)					
Marasmius oreades	(Bolton) Fr.	Saprophytic	Grasslands	VC	
Basidiomycetes (Coprinus and Panaeolus)					
Coprinopsis atramentaria	(Bul.) Redhead, Vilgalys & Moncalvo	Saprophytic	Forest (terrestrial)	C	X
Coprinopsis nivea	(Pers.) Redhead, Vilgalys & Moncalvo	Saprophytic	Dung	C	X
Panaeolus papilionaceus	(Bull.) Quél.	Saprophytic	Dung	VC	X
Panaeolus semiovatus	(Sowerby) S. Lundell & Nannf.	Saprophytic	Dung	U	
Protostropharia semiglobata	(Batsch : Fr.) Redhead, Moncalvo, Vilgalys	Saprophytic	Dung	U	X

Basidiomycetes (Agaricus and Lepiota)					
Agaricus bitorquis	(Quél.) Sacc.	Saprophytic	Grasslands	U	X
Agaricus campestris	L.	Saprophytic	Grasslands	C	
Agaricus sect. *Arvense*	Konrad & Maubl.	Saprophytic	Grasslands	U	X
Chlorophyllum sp.	Massee	Saprophytic	Grasslands	R	
Basidiomycetes (Pluteus and related fungi)					
Pluteus sp.	Fr.	Lignicolous	Wood	U	X
Volvariella sp.	Speg.	Saprophytic	Disturbed areas	U	X
Volvopluteus gloiocephalus	(DC.) Vizzini, Contu & Justo	Saprophytic	Disturbed areas	U	X
Basidiomycetes (Lactarius and Russula)					
Russula lutea	(Huds.) Gray	Ectomycorrhizal	Forest (terrestrial)	C	X
Russula sp. #1	Pers.	Ectomycorrhizal	Forest (terrestrial)	C	X
Russula sp. #2	Pers.	Ectomycorrhizal	Forest (terrestrial)	C	X
Russula sp. #3	Pers.	Ectomycorrhizal	Forest (terrestrial)	C	X
Basidiomycetes (Boletes and related fungi)					
Leccinum sp.	Gray	Ectomycorrhizal	Forest (terrestrial)	C	X
Basidiomycetes (Gasteromycetes)					
Battarrea phalloides	(Dicks.) Pers.	Saprophytic	Desert (Grasslands)	R	X
Bovista pusilla	(Batsch) Pers.	Saprophytic	Exposed soil (Grasslands)	C	X
Calvatia bovista	(L.) Pers.	Saprophytic	Grasslands	U	X
Calvatia cyathiformis	(Bosc) Morgan	Saprophytic	Grasslands	VC	X
Lycoperdon excipuliforme	(Scop.) Pers.	Saprophytic	Exposed soil (Forest)	U	X
Lycoperdon perlatum	Pers.	Saprophytic	Disturbed areas	C	X
Phallus hadriani	Vent.	Saprophytic	Exposed soil (Grasslands)	R	X
Tulostoma sp.	Pers.	Saprophytic	Grasslands	U	X

* VC = very common, C = common, U = uncommon, R = Rare (within respective habitat)

** X represents at least one representative specimen collected (some doubles)

Further study into certain mushrooms not identified to species may yield new records of endemic or rare species. A white, minute-sized *Arrhenia* sp. was spotted only a few times in grasslands where spike moss (*Selaginella densa*) was common. It was sometimes growing in an interesting microhabitat - along the sides of soil in depressions from bison hoof-prints. In similar mossy grassland habitats an unidentified species of *Clitocybe* was very common while a mysterious *Polyporales* was very rare. Brightly coloured waxcap mushrooms (*Hygrocybe* spp.) were only recorded from a few submitted photographs.

More detailed information on individual species from this study has been provided to park staff as a basis for future studies and to facilitate incorporating conspicuous mushrooms (such as the fairy rings, large puffballs, and dung fungi) into interpretive programming. All photos and data are available for viewing online at MushroomObserver.org. Further studies and increased public awareness at GNP will help us to understand the unique fungi of the prairies.

Acknowledgements

Thank you to staff at Grasslands National Park for granting me the collection permit. Special thanks to everyone that contributed photos and GPS locations to the project or made me aware of areas to search: Ryan Boxem, Jordan Steingass, Nick & Krista Cairns, Heather Sauder, Kelsey Van-Dyke, Dennis Morgan, Ashley Wruth, Colette Schmidt, Alaïs Nevert, Sarah Ludlow, Lacey Hebert, and Martin Kastner.

Thanks also to curator Dr. Cory Sheffield and assistant Adam Crosby of the Royal Saskatchewan Museum for accepting specimens of this study into the RSM collections. Diana Robson of the Manitoba Museum provided valuable feedback on an earlier manuscript of this submission.

Finally thanks to the mycological community on MushroomObserver.org for assisting in the identification process.

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NOTES and LETTERS

VOLE FREEZES FROM WINTER EXPOSURE

PHILIP S. TAYLOR, Saskatoon, SK.

On December 10, 2013 , at midday, I looked out on our snowy backyard in Saskatoon. It was a sunny day, but with winds from the NW blowing about 18kph, it was cold (-23C, but feeling like -33C with the windchill) (Environment Canada web site: http://climate.weather.gc.ca/advanceSearch/searchHistoricDataStations). Then, something caught my eye that had not been there a short while earlier: a fresh set of tracks in the new snow (Figure 1).

With binoculars I could see they were made by a small mammal. It had crossed the fluffy snow surface, stopping occasionally, and then changing directions before proceeding (Figures 1, 2). Where was it going on such a cold day? At the end of the track was a small ball of grey-brown fur, huddled near our garage, unmoving (Figure 3). It had bounded a distance of over 27m above the snow before stopping.

I went outside, and closer inspection revealed still no movement. It was a Meadow Vole (*Microtus pennsylvanicus*) and appeared to be a subadult, thin and much underweight: length of body approx 100mm; length of tail approx 30mm.[1] It had died before returning to the protection of the snow cover.

Figure 1. *Vole tracks showing bounding gate in soft snow.*

Had this vole stayed below the snow surface it would not have been exposed to the severe cold and windchill, perhaps enabling it to survive until it found some food. The insulating properties of snow are remarkable affording protection to creatures adapted to live in a subnivian environment during the winter. Temperatures

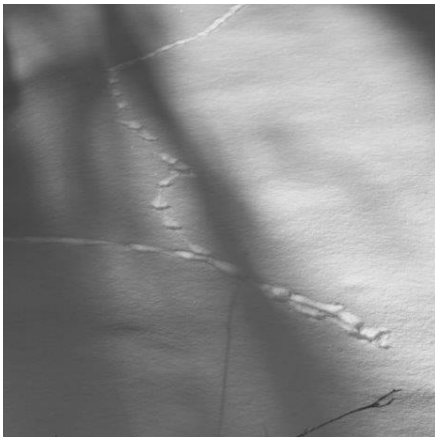

Figure 2. *Vole tracks zig-zagging across surface of soft snow.*

under even 20cm of snow are 15C warmer than the air temperatures above the snow, and of course windchills are not a factor.[2]

What forced this vole above the snow we'll never know but in other circumstances it might have been easy prey for an owl or other predator. Freezing to death is but one of the many hazards facing a small rodent.

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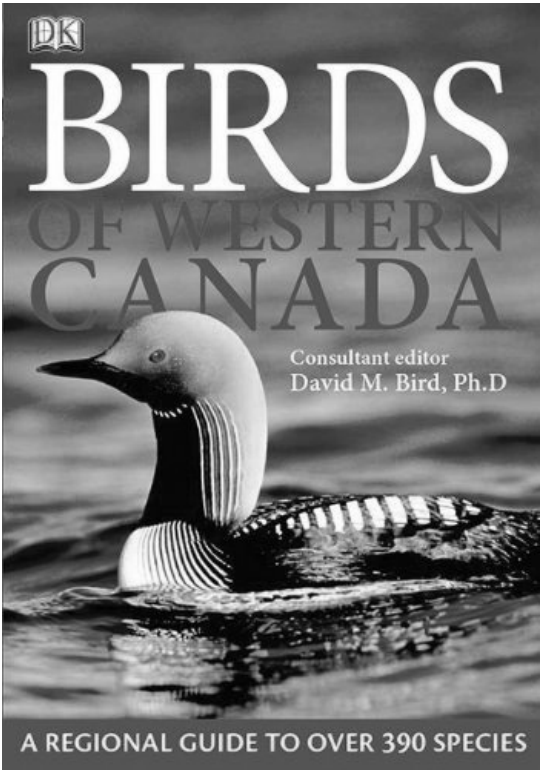
Figure 3. *Frozen Meadow Vole, in posture found.*

White-tailed deer *-Christian Artuso*

BOOK REVIEWS

BIRDS OF WESTERN CANADA. 2013. David M. Bird (Consulting Editor).

Dorling Kindersley, New York, NY. Softcover. $22.95 CDN.
ISBN: 978-1-55363-194-1. 439 pages. 15.4 cm by 21.0 cm.



The Birds of Western Canada incorporates aspects of bird identification, life history features, and behaviour in a comprehensive and attractive bird guide. In contrast, most other bird guides either focus on identification or behaviour, but not both. Birds of Western Canada contains full-page accounts for about 390 bird species common to western Canada (west of 100°W - near Winnipeg - ideal for most Nature Saskatchewan members), and quarter- page entries for 20 rare species. The 'eastern' version of this field guide has 350 species. This book covers western Canada, as well as adjacent coastal waters. The format is

similar to Dorling Kindersley's latest edition of Birds of North America and Birds of Canada.[1, 2]

Inside the Birds of Western Canada, the species entries are ordered by conventional classification. Before your first use of the book, I recommend reading the section titled 'How This Book Works' in the introduction. It explains each portion of the species accounts in all sections of the book. Each bird family section begins with a useful and colourful page introducing typical species in the family and their habitats.

The accounts for common 'western Canadian' bird species are attractively arranged and full of useful and interesting natural history information. The information and photos are identical in the 390 species accounts common to both the Birds of Canada and the Birds of North America. I particularly like the large primary and smaller secondary photos and bird-in-flight illustrations, each with key identifying features clearly marked. These photos illustrate species in different views and plumage variations, including subspecies, sex, adult/juvenile, and seasonal. All photos, illustrations and range maps are clear and sharp. The natural history characteristics of each species are neatly summarized in the text or in the bottom panel of the page. You can quickly learn the voice, nesting habits, feeding habits, range, flight patterns, occurrence, social system, wingspan, size, lifespan, mass, and conservation status for each species. These accounts also contain an additional photo that reveals typical habitat or behaviour. The natural history information presented here is accurate and appears to be up to date. Each species account has a very useful insert box containing one to three similar species, highlighting their differences. These boxes also state on what page in the book you can quickly find accounts of similar species. An interesting addition to the species accounts is a very small space at the bottom of the page for readers to record date, time and location of an observation of the bird species.

The rare species accounts contain one excellent photo each with diagnostic features pointed out, common and scientific species and family names, a brief description of the species and information about occurrence in Canada, voice, and size. Unlike Birds of Canada and Birds of North America, vagrant species are not mentioned.

The introduction to the Birds of

Western Canada also includes the same two–page summaries found in the Birds of the North America. They cover the following topics: avian evolution, anatomy and flight, bird migration, courtship and mating, nest and eggs and bird identification.. These summaries are supported by relevant and attractive colour photos and illustrations. The bird identification article was particularly insightful about the key identification features. An article on bird habitats would perhaps have been useful here but was not included in this volume or in the Birds of North America or the Birds of Canada.

The table of contents is very reader-friendly with the species guide portion divided by the common name of bird families. Unlike the Birds of North America and Birds of Canada, the Birds of Western Canada concludes with a two-page glossary of avian terms, a very useful detailed index, and photo credit acknowledgements. Unfortunately, no bibliography or further reading section was included in the volume, which is unfortunate for those readers who may want to learn more about the topics discussed.

The publisher pitches the Birds of Western Canada as a bird guide. It is larger than most bird guides, still, the Birds of Western Canada can be used in the field. It has a less sturdy, but more somewhat pliable binding. Aside from a few minor deficiencies, this is a very useful and beautiful volume. I highly recommend Birds of Western Canada to anyone who is a keen birder in western Canada or wants to focus their learning on the common birds of western Canada.

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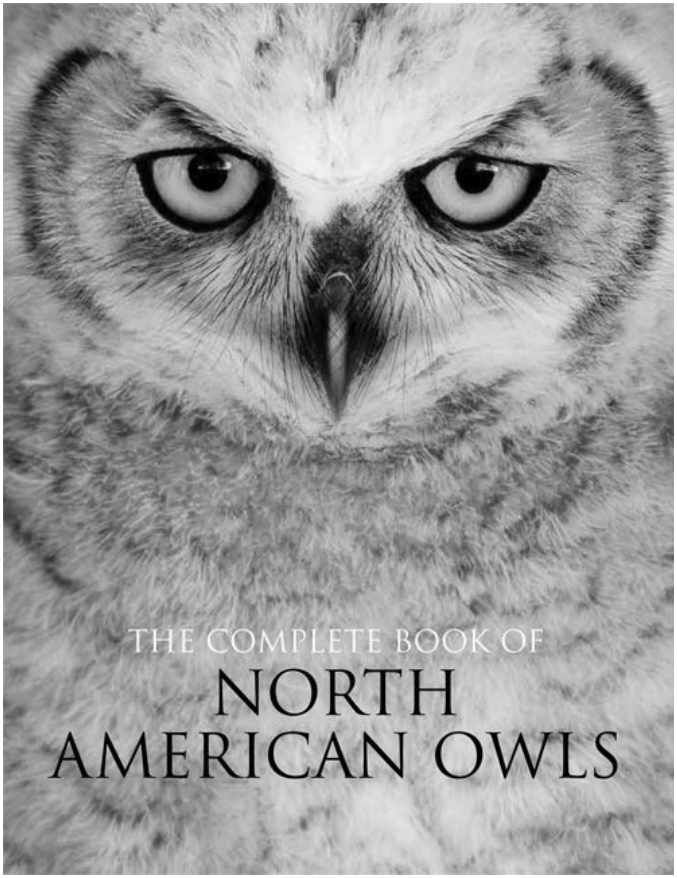
Reviewed by Rob Warnock, email: *warnockr@myaccess.ca*

THE COMPLETE BOOK OF NORTH AMERICAN OWLS. 2013. JAMES R. DUNCAN.

Thunder Bay Press, San Diego, CA. Soft Cover. $19.95 US.
ISBN 13: 978-1-60710-726-2. 192 pages. 19.1 cm by 24.8 cm.



The Complete Book of North American Owls begins with a short chapter titled 'What is an owl?' with a definition, very short review of owl evolution, key identifying features and behaviour, and a brief review of recent changes in of owl taxonomy. The next chapter reviews special adaptations of owls, including camouflage, hearing, silent flight, vision, olfaction and toes and talons. The final chapter of the first section reviews biology applicable to all owl species in including predation, breeding, mate choice, prey and feeding, nesting and dispersal and distribution and conservation. The first section is well written with lots of interesting

facts about owls including other bird species nesting near owl nests. Inclusion of the author's and other researchers interesting experiences with owls was a good idea as it brings the owl story to a more personal level for the reader. The section on the use of newly developed solar powered platform terminal transmitters for tracking Short-eared Owls during dispersal and migration was particularly interesting. However, one section seemed to be missing from this book, owls and people. The author had this fascinating section in his first book on owls. [2] Information about owl biology and behaviour is more concise in this volume than in comparable owl books by Johnsgard, Lynch or Backhouse or the author's first book on owls.[1,2,3,4] However, this book's biology and behaviour section is definitely more than adequate for readers to become more familiar with owl biology and behaviour. The information is current, accurate, easy to read and accessible with minimal technical jargon. I liked the storytelling approach the author used. This book covers more owl species (46) than Johnsgard (41 species), Lynch (19 species) or Backhouse (23 species) due to the inclusion of Central America and the Caribbean in the coverage area and recent changes in owl taxonomy.[1,3,4]

The next section of the book, species profiles, begins with a very brief note on text and maps. Each species has a profile with at least one photo. Length of the species profiles range from one page with a page sized photo for the least studied species, up to six pages with more photos for better studied species. Each species profile contains a text box with information about the range of physical dimensions and weight, and a small range map. I would prefer larger range maps. Unlike other owl books such as Backhouse, the text is not formally divided into sections with subheadings.[1] Instead, the well-written text flows naturally as a seamless narrative. Like the first section, the species profile information is accurate and accessible with minimal technical jargon. Each species profile text contains known information about the species identification features, distribution and preferred habitats, vocalizations, breeding and nesting biology, hunting and feeding biology, and ends with threats to species and the species global conservation status. Gaps in our knowledge about certain owl species are clearly acknowledged in the species profiles.

A key strength of the book are the outstanding photographs. There is at least one photo for each owl species in the book. The

photographs do greatly enhance the strong text throughout the book.

Other recent owl books include a handy glossary (Johnsgard, Backhouse) and/or a much larger bibliography (Johnsgard, Lynch).[1,3,4] A glossary and larger bibliography would have strengthened this book. However, the author includes a few reputable internet resources about bird conservation and owls such as *owlpages.com*. A detailed and helpful index in the back of the book does more than make up for a skimpy Table of Contents.

This book's many strengths greatly outweigh the relatively minor shortcomings. I really enjoyed the book and learned new things about owls. Therefore, I highly recommend this attractive and relatively inexpensive book to anyone who is interested in the owls of North and Central America and the Caribbean.

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Reviewed by Rob Warnock, email: *warnockr@myaccess.ca*

Mule deer antler *- Lowell Strauss*

Great horned owl *-Nick Saunders*

Northern hawk owl *-Christian Artuso*

SERIES: LEARN YOUR LICHENS

BERNARD DE VRIES email : *bdevries@accesscomm.ca*

Common Name: Orange rock-posy

Scientific Name: *Rhyzoplaca chrysoleuca* (Sm.) Zopf.

Synonyms: *Lecanora chrysoleuca*, *L. rubina*

Description: The vegetative body (thallus) of this lichen is pale yellowish green to dull yellow grey with round and rather closely appressed to irregular lobes, or centrally thick and lumpy covered with warts and lobules (small scale-like lobes). The lower surface (cortex) is light brown, but sometimes greenish black at the outer margins. The lichen lacks hair-like attachments (rhizines), but instead has a thick central holdfast (umbelicus). The sessile abundant pale to dark orange fruiting bodies (apothecia) with thick or thin margins can reach 2-5 mm in diameter and are very showy. The disks are slightly hollow (concave) at first, becoming flat or somewhat rounded (convex) at a later stage of development.

Habitat: On granitic rock or sometimes on erratic sandstone boulders on open grasslands.

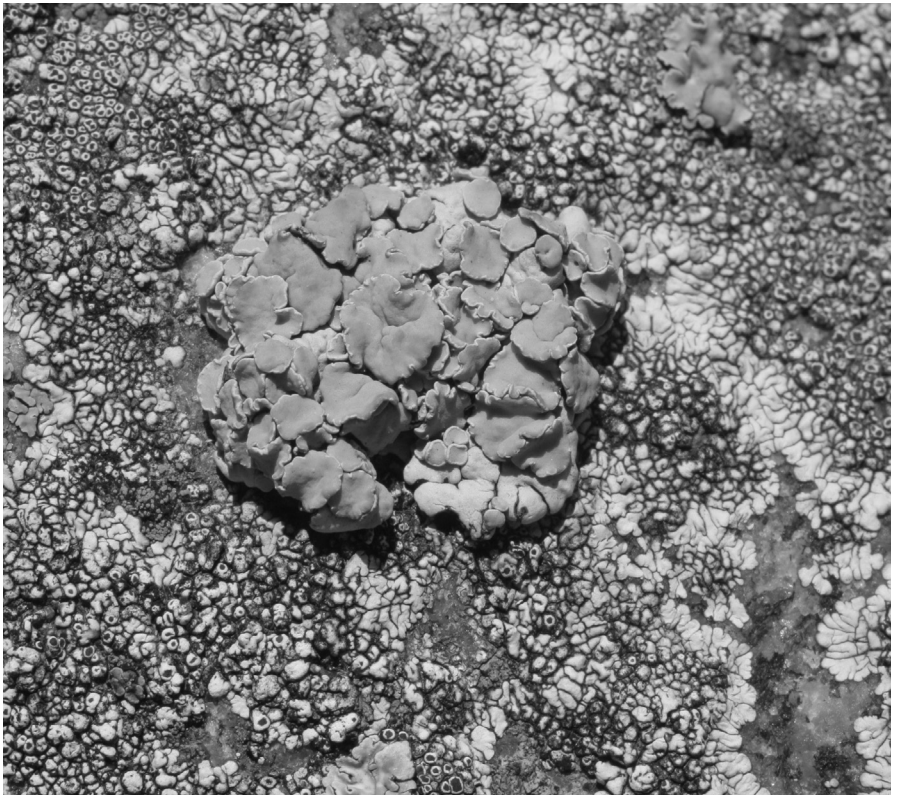
Growth form: Suggesting leaf-like lobes (foliose).

Provincial Status: Scattered, but can be locally common in the southern grasslands. Occasional in open boreal forest.

Comments: Due to its close attachment, the lichen can appear to be tightly adherent (crustose) but unlike such species, is attached by a single holdfast. It often is found with other rock species such as: Desert firedot lichen (*Caloplaca trachyphylla*), Golden moonglow lichen (*Dimelaena oreina*), Green rock-posy (*Rhizoplaca melanophthalma*) and Salted rock-shield (*Xanthoparmelia mexicana)*.

This a series depicting some of the common and showy lichen species. The author hopes that you enjoyed this brief glimpse into our fascinating lichen flora, and will continue the series in 2014. Any comments or suggestions you might have would be appreciated. Thank you.

email : *bdevries@accesscomm.ca*



*Orange rock-posy, (*Rhyzoplaca chrysoleuca *(Sm.) Zopf. (see inside back cover for colour image)* *- Bernard de Vries*

MYSTERY PHOTO

Mystery photo December 2013:

Blue Jay reader Harvey Schmidt found a smiling face in nature. Being a photographer who specializes in macro (close-up) photography, he managed to get a photo of that smiling face. Besides being small, this cheeky grin is in an unexpected place. The mystery in this photo is: where is the smile and on what? Bonus points for identification and latin name.

- Harvey Schmidt

Please send your answers to the Blue Jay editors *bluejay@naturesask.ca*
- See back cover for colour photo

ANSWER TO THE JUNE 2013 MYSTERY PHOTO:

-Vicky Kjoss

Much of the answer for the Sept 2013 Mystery photo comes from Blue Jay reader Ryan Dudragne. He writes: “The bird depicted is clearly an albino shorebird, and based on body shape and proportions we can further say with certainty that is a plover (*Charadrius* sp.). But which one? The photographer

gives us a hint, and indeed this combined with the above characteristics narrow our choices down to either Piping Plover (PIPL) or Semipalmated Plover (SEPL). Both are found in SK and MA, the former as a breeder and the latter as a (mainly) non-breeding migrant.

Of course, we are unable to use typical plumage cues to help us in our decision, but one potentially useful criterion is the primary projection length compared to the tail which, in the photograph provided appears fairly long and would possibly support an identification of SEPL. One approximation of this would be a wing chord-tail length ratio. Based on calculations from Pyle's Identification Guide to North American Birds, Part 2 (2008), PIPL averages a slightly shorter wing chord and thus smaller ratio than SEPL, not corrected for sex-- Pyle remarks that "measurements are largely unhelpful for sexing" (pp. 529), and indeed we cannot determine sex from the photograph anyway. However, the difference is slight, and not significant when we take standard deviation of the values into account.

The bird depicted in the photograph appears to have somewhat of a shorter, more stout bill than one would typically observe on a SEPL; although there is overlap in bill depth measurements in Pyle, the bill of a SEPL tends to gradually taper slightly towards the tip, whereas the taper is more abrupt for PIPL. However, this is a bit subjective given the still photograph; indeed, this appears differently depending on whether one is looking at the black-and-white image on pp. 158 or the coloured image on the back cover. Given the structural similarity and overlap of differences in body and bill structure, I do not believe that one can say with absolute certainty which of the two plovers is presented here."

Thanks to Ryan for a thoughtful walk through the process of identifying such an interesting bird.

We have also consulted with both the photographer and a number of bird experts. All of them chose the identification of **leucistic Piping Plover** for this individual.

Joseph Kotlar submitted a correct guess for this mystery, and was drawn as our winner for a prize from Nature Saskatchewan. Congratulations, Joe!

Blue Jay Index 2013 (Volume 71)

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Common and scientific (Latin) names are used for all species. Common bird names follow the Checklist of North American birds by the American Ornithologists' Union (7th edition, 1998); mammal names: Mammal Species of the World by Wilson & Reeder; butterfly names: The Butterflies of Canada by Layberry et al.;and names of reptiles and amphibians follow Scientific and Standard English Names of Amphibians and Reptiles of North America north of Mexico, with Comments Regarding Confidence in our understanding, Seventh Edition, SSAR Herpetological Circular No. 39. (Brian I Crother, ed.) (2012).

Photographs may be submitted as digital images or as prints. For the best quality reproduction on paper, high-resolution (≥600 DPI) images are required, although in some cases, lower-resolution images may provide sufficient quality. Digital images can be sent by E-mail directly to the editors, or if the files are very large, they should be put on a CD and mailed to the editors at the address above.

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* ***Do you know*** of any person interested in natural history and conservation who does not receive the Blue Jay? Please send their name and address and we will send a sample Blue Jay and an invitation to join our Society.

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